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Title: Interview of Former Rocky Flats Plant Employees Regarding Spontaneous Ignition Accidents

Author(s): Chancellor, Christopher John

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Memo

To: Paul Duval
From: Christopher Chancellor (LANL-CO)
CC: Tim Burns, Doug Weaver
Date: July 23, 2018
Re: Interview of Former Rocky Flats Plant Employees Regarding Spontaneous Ignition Accidents

Background

Rocky Flats Plant (RFP) experienced a number of spontaneous ignition events over the years. The data associated with these accidents are useful in preventing re-occurrence in current times. Unfortunately, the written record regarding these past events is often difficult to obtain. A few former RFP employees have graciously agreed to respond to a series of questions regarding documented events and offer observations they made during their employment at RFP (Attachment 1).

History

A safety analysis being conducted by the Los Alamos National Laboratory - Carlsbad Operations (LANL-CO) field office is focused on the autocatalytic, thermal runaway event that may occur in waste that contains cellulosic materials and nitric acid / nitrate salts. Thermal runaway events at the RFP may fall into this area of concern.

Data

The interview (Attachment 1) indicates that cellulosic materials (Kimwipes, cotton full flow filters, etc.) were exposed to nitric acid and sealed in non-vented plastic bags. Kimwipes exposed to nitric acid were typically rinsed and hung to dry before bagging them out into a 55-gallon drum. It was desired that the wipes would fully dry before bagout, but it was observed that this did not always occur. It was observed that the Kimwipes hung to dry turned light brown in areas before bagout. Full flow filters were rinsed, but never allowed to fully dry before bagout.

In the mid to late 1980s, a spontaneous ignition event was observed in the time frame of 1 to 2 days after rinsed, and still damp, Kimwipes were bagged out into two (2) "in process drums". The drums, still in building 771, were at room temperature. The event was described as smoldering wipes. Mitigation of the self-igniting characteristic of this waste involved returning it to the process line to again be rinsed and dried.

The interviewees were asked about some documented events that may have involved thermal runaway events during the 1959 to 1978 time period, but they were unaware of documented combustion accidents prior to their employment starting in the early 1980s. During the 1980s-2000s time period, it was noted that a chemical reaction pressurized a glove box and blew out the HEPA filter but no additional details about the incident were available.

Recommendation

From these interviews it can be discerned that the smoldering of Kimwipes contaminated with nitric acid¹ has been observed to occur within 1 to 2 days. This observation is a data point that may be used in an effort to document the latency period for an accident scenario caused by the autocatalytic thermal runaway of a cellulosic and nitric acid.

¹ In a follow up response to this interview, interviewee John Bretzke recalls nitric acid concentrations used at RFP ranged from 0.35 molar to 12 molar. He suggests that assuming the smoldering rags were fully rinsed would be a reach due to the rarity of such an event in the process line during his time there.

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Email originating from LANL-CO in Carlsbad, NM

Date: June 28, 2018

Time: 4:45 PM

Interviewee 1: Jerri Lynne McTaggart

Interviewee 2: Kevin McTaggart

Interviewee 3: John Clifford Bretzke

Interviewer: Christopher Chancellor

Question 1: What dates were you employed at the Rocky Flats Plant?

Jerri: February 21, 1984 to May 6, 2002

Kevin: March 29, 1982 to July 2002

John: July 1981 to January 1992

Question 2: What facilities did you work in / during what period?

Jerri: Buildings 771 (9.5 years), 559 (2 years), 371 (3 months), 707/776 (7.5 years)

Kevin: 707, 776/777 and 779

John: Building 371 and 771 from 1981 to 1989. Building 111 from 1990 to 1991.

Question 3: What facilities / processes would have used nitric acid?

Jerri: Many of the aqueous plutonium processes in 771 used nitric acid. I do not remember 707 using nitric acid in the gloveboxes that I dealt with. 371 used some nitric acid, but I was in NDA when I worked in that building and would not be able to provide you any further information.

Kevin: I did not use any in my processes. We used Carbon Tetrachloride and Trichloroethane

John: Nitric acid was the primary solvent for the plutonium recovery operations in building 771. Building 371 had nitric acid introduced to the system during startup of the facility, however, the aqueous process was never placed into full operations.

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Question 4: What facilities / processes would have used cheese cloth?

Jerri: I never remember using cheesecloth. We used a thick Kimwipe for everything. The Kimwipe was a thick fibrous wipe (like a thick bounty paper towel). We used them in all of 771 with all chemicals including nitric acid. This wipe was all we ever used besides a terrycloth bath towels from the locker room to clean up the inside of gloveboxes before inventory.

Kevin: We did not ever use Cheesecloth

John: My memory matches Jerri's.

Question 5: What combustibles other than cheese cloth were exposed to nitric acid / nitrate salts (e.g.: Kim-Wipes)?

Jerri: Again we did not use cheesecloth that I ever saw. We used Kimwipes and terry cloth bath towels for wiping. We also have cotton full flow filters that had nitric acid and HF on them. The filters were always bagged out into a clamshell (a top and bottom screw together container that was made out of a hard plastic. The dissolution processes generated a round thin filter called an R-filter that was a filter paper type material. These would have been bagged out into a bag. Plastic non-vented bagout bags and vinyl tape were used for every bagout.

Kevin: We did not use Cheesecloth or nitric acid in any of the processes that I worked in.

John: Again, Jerri's memory matches mine. I would add that bag-out bags could also qualify as a combustible along with some filter papers used in the dissolution process. Anion exchange resin was also a worry.

Question 6: Please describe the difference (generation, composition, etc.) between "wet" and "dry" combustibles?

Jerri: Wet combustibles were just that "wet" or "damp" (IDC 336) with KW formula² (contained EDTA) which was our cleaning solution for deconning, chemicals including nitric acid, or in some cases water. Dry was waste that did not have any liquid or was not damp (IDC 330). This could be paper cartons from sampling, cardboard or dry Kimwipes for checking gloves. All of our waste had different IDC's so this would not have included any plastics (IDC 337), metal (480) or filters (IDC 331).³

² KW formula is made in 50 gallon batches and contains 600g of versene (EDTA solution), 640g of citric acid, 500 mL of Igepal (detergent), and the remainder of the volume is water: McTaggart, Jerri (2008) Email from Jeff Harrison with the KW Formula, INV-0801-01-01-10, Los Alamos National Laboratory Carlsbad Office: Carlsbad, NM.

³ Rocky Mountain Remediation Services, LLC (1996), Backlog Waste Reassessment Baseline Book, Waste Form 52, Combustibles, Rocky Flats Environmental Technology Site: Golden, CO.

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IDC 330 (Dry Combustibles): Dry combustibles such as cloth, paper and wood.

IDC 336 (Wet Combustibles): Wet combustibles are materials such as paper, cloth and wood, which contain discernible amount of moisture. Must be drained or wrung out prior to packaging to prevent an accumulation of free liquid.

IDC 337 (Plastic (Teflon, PVC, Polyethylene)): PVC sheeting, poly bottles, supplied-air suits, polyethylene, and other plastics.

Kevin: Jerri's description is accurate.

John: My memory matches Jerri's.

Question 7: On page 25 of the Economic Evaluation of Volume Reduction for Defense Transuranic Waste⁴, compaction of combustibles (e.g.: rags) was accomplished by a hydraulic or air operated ram which forced the bulk waste into its final container. The volume reductions were reported to be 30-35%. Please describe this process and alternative packaging of combustibles.

Jerri: I ran the compactor in 776 from the time it started until we were shut down. We segregated glass, metal, plastic and paper combustibles. Again, these were IDC specific and always segregated even in compaction. What we call wet (damp at the very most) or dry combustibles compacted well and we usually could compact 2-3 55-gallon drums worth of combustibles with some spring back but not much. The plastics had the highest spring back after compaction of about 6 inches, so we had to compact 2-3 55-gallon drums worth. Glass produced the best compaction and had very little spring back. Metal compacted well with a small amount of spring back. All waste was sorted (for different IDC's) and then packed into a 30-gallon drum to be compacted into a puck. The pucks were then packed into a 55-gallon drum. The compactor ran great and performed well, however EPA shut the project down because this was considered treatment.

Kevin: I did not ever run the compactor in 776.

John: I have nothing to add here.

Question 8: We are aware a process was conducted for rinsing combustibles exposed to nitric acid. Can you describe the process? Where other materials targeted for rinsing? Over what period was it conducted? How often was the rinse water changed? Further detail.

Jerri: I washed Kimwipes several times in Line 2 in building 771 that had nitric acid on them. They were usually from a crit drain over flowing onto the floor or a spill of nitric acid that was carried from the cold lab. We would bag the wipes into Line 2 and water wash the Kimwipes. The wipes were hung over piping inside the glovebox to dry before bagging them out into a 55-gallon drum. I do not remember

⁴ Brown, C. M. (1981) Economic Evaluation of Volume Reduction for Defense Transuranic Waste, RFP—3245, Rockwell International, Energy Systems Group, Rocky Flats Plant: Golden, CO.

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rinsing any other item that might have been exposed to nitric acid. We would let our full flow filters drip dry, but never fully dry. I worked from 2/84 to 3/93 in 771 and washed wipes approximately 10 times during that time. The rinsing was always done with clean water and that water was sent to treatment through piping. While we tried to ensure the wipes were dry before they were bagged out, on at least 2 occasions the wipes were not fully dried.

Kevin: We never used cheesecloth or nitric acid in the processes I worked in.

John: My memory matches Jerri's.

Question 9: Are you aware of spontaneous ignition events that where not caused by pyrophoric materials such as sodium metal and plutonium fines? When did they occur? How long was the latency period from when the situation was created before it started burning? Were other factors at play such as high ambient temperatures, change in process, etc.?

Jerri: The wipes, mentioned above in question eight that had nitric acid and rinsed, starting smoldering about 1-2 days after they were bagged out into an in process drum. The wipes were still dampish when we bagged them back in so they were not completely dry when they were first bagged out. We had to bag them back into line 2 and rinse and dry them again. The temperatures in the room were probably around 74 degrees F (room temperature). I do not remember any change in processing other than feed material from time to time.

Kevin: J Module had a HEPA filter blew off the box. I believe it was a chemical reaction that over pressurized the box.

John: I don't remember any smoldering, however, I do remember seeing Kimwipes hung on pipes to dry that turned light brown in areas. I believe this was more of a concentrating of nitrates vs combustion.

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Question 10: Do you have any insight on any of the following incidents that are listed in the DOE occurrence reporting system's Summary of Events (1952- 1988) and Summary of 1989 Events⁵ or Chronology of Incidents Reported for Building 771⁶?

Date	Bldg., Rm. ⁷	Event
01/28/59	881, 235	<i>Spontaneous combustion of nitric acid and rubber inside metal drum</i>
09/19/62	771, Hallway	<i>Spontaneous combustion rubber gloves and nitric acid</i>
09/17/63	771, 188	<i>Rag and glove fire in dissolver box</i>
02/18/66	771, 248	<i>Ignition of combustible material in barrel.</i>
07/10/66	771, 149	<i>Combustibles in waste drum ignited by nitric acid.</i>
02/20/67	771, 159	<i>Spontaneous combustion of nitric acid and Kim-Wipes</i>
03/06/67	771, 114	<i>Spontaneous combustion of nitric acid and rubber gloves inside glovebox</i>
06/13/67	776, 134	<i>Spontaneous combustion of combustible waste inside barrel in glovebox</i>
10/14/68	771, 114	<i>Spontaneous combustion between nitric acid and combustible waste</i>
11/26/68	771, 114	<i>Spontaneous combustion between nitric acid and combustible waste</i>
02/07/69	771, 114	<i>Spontaneous combustion between leaded gloves and acid inside paper box.</i>
07/07/69	776, 134	<i>Glovebox glove lying on floor ignited – cause unknown</i>
10/17/69	776, 134	<i>Spontaneous combustion between cleaning solution and Kim-Wipes</i>
02/18/71	771, 114	<i>Spontaneous ignition of combustibles in waste drum.</i>
04/10/72	771, 149	<i>Chemical reaction within waste drum.</i>
01/23/76	771, 147	<i>A 1 gallon container filled with towels, used to clean up nitric spill in a line, was found. Reddish brown fumes were being emitted: Sur-Viv-Air units were used to investigate and move the container to Line 3.</i>
01/24/76	771, -	<i>Cotton towels used to clean up nitric acid spill were not thoroughly washed before discarded. Reaction occurred. No injuries. No contamination released.</i>
12/04/78	774, -	<i>Nitrate salt fire, ignition. Source unknown.</i>
12/04/78	774, -	<i>Combustible trash ignited. This ignited shipping container with processed salts.</i>

⁵ DOE occurrence reporting system's Summary of Events (1952- 1988) and Summary of 1989 Events buried in following document: DeMaiori, A. W. (2005) Communication from Anthony W. DeMaiori to SEC Petition, Office of Compensation Analysis and Support, regarding Special Exposure Cohort Petition, Form B, and All Relevant Supporting Documentation, United Steelworkers of America, Local 8031: Golden, CO, starting on p.404.

⁶ Unnamed Rocky Flats Industrial Safety Engineer (2012) Chronology of Incidents Reported for Building 771, Downloaded 06/05/2018 from: <https://www.cdc.gov/niosh/ocas/pdfs/d32/carroll-043017-13.pdf>

⁷ Buildings identified are as follows: **444** – A-Plant, Depleted Uranium & Beryllium Metallurgy & Machining; **771** – C-Plant, Plutonium Recovery Operations; **774** – Process Waste Treatment Facility / Nuclear Waste Packaging Facility; **776** – Assembly & Manufacturing / Plutonium Machining; **881** – B-Plant, Enriched Uranium Recovery & Manufacturing. Source: Abbott, C. et al. (2004) Historical Background Report for Rocky Flats Plant Waste Shipped to the INEEL and Buried in the SDA from 1954 through 1971, ICP/EXT-04-00248, Rev.0, North Winds, Inc.: Idaho Falls, ID.

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Jerri: I am not aware of any of the events other than what I have heard about the fire in 69 in 776 from combustibles in a glovebox that was ignited by pyrophoric metal pieces. The Kimwipes and nitric I have seen when I worked in 771 (see question 9).

Kevin: I only heard about the 1969 fire because my dad helped clean up after the fire.

John: I have nothing to add here.

Question 11: On page 7 of the Incineration of Plutonium Contaminated Waste Materials⁸, it is noted that the bulk density of the combustible waste should average 5.5 lbs. per cubic foot (ranging from 3 to 11 lbs. per cubic foot). Do you have an insight on this information?

Jerri: Everything we ran through the incinerator fit in a 55-gallon drum (0.208 m³) that we would hoist up to the drum dump area and bag the waste into the incinerator. Most combustible drums weighted on average maybe 50 to 60 pounds net weight. Some of the drums could reach 100 lbs. This was wet and dry combustibles. I do not believe plastics ever went to the incinerator. So the waste would have been the wipes, paper, cardboard, and wood. I am attaching a document from the Backlog Re-Characterization book (see reference 1).

Kevin: Never worked in 771

John: I have nothing to add here.

Question 12: Do you have any insight on the following incident listed in Rocky Flats Plant – Site Description⁹?

June 15, 1971 A fire started in a shipment of drummed radioactive waste on its way to Idaho and self-extinguished (no exposures).

Jerri: I do not know about this incident.

Kevin: I do not know about this incident.

John: I do not know about this incident.

⁸ Foster, R. S. (1966) Incineration of Plutonium Contaminated Waste Materials, RFP-735, The DOW Chemical Company, Rocky Flats Division: Golden, CO.

⁹ Flack, S.; Meyer, R. (2007) Rocky Flats Plant – Site Description, ORAUT-TKBS-0011-2, Rev.1, ORAU Team Dose Reconstruction Project for NIOSH, Oak Ridge Associated Universities / Dade Moeller & Associates / MJW Corporation, p.72.

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Question 13: Do you have any insight on the latency time between exposure of a combustible and nitric acid / nitrate salt and an event caused by the spontaneous ignition?

Jerri: We had 2 drums, with the Kimwipes and nitric acid, that we bagged out from line 2 after rinsing, that began to smolder within 1-2 days after placing them in the in-process drum. This incident would have been between 1984 and 1988. The FBI raid shut us down in 1988.

Kevin: No, we did not use nitric acid in 707, 776/777.

John: I have nothing to add here. I will note that the FBI raid was on June 6th, 1989.